12. NOTES ON THE BIONOMICS OF THE FLYING LIZARD, *DRACO DUSSUMIERI* DUM. & BIB.

Draco dussumieri Dum. & Bib., an arboreal Agamid lizard, is common in many parts of Kerala, but the distribution appears to be local and erratic. In all 36 specimens (22 ♀♀, 14 ♂♂) were obtained, some from hilly regions, e.g. Kallar (200 m.) in Trivandrum District and Pathanapuram (60 m.) in Quilon District, and some from low country, e.g. Kulakulam (50 m.) in Kottayam District and Piravom (20 m.) in Ernakulam District. In the two places named last the lizards were found in the coconut and arecanut plantations on the banks of the Moovattupuzha River.

The agility and the swiftness which the lizards display on the trees is in marked contrast to their relative helplessness on the ground. On the tree the body is held close to the trunk with the head raised at an angle of about 45°. As noted by Günther (1864, REPTILES OF BRITISH INDIA: 122) the ordinary movements of the lizard climbing a vertical trunk are a series of jerky movements; but if pursued the patagia are slightly opened and the animal leaps a short distance dodging if necessary to avoid capture.

The patagium or 'wing' membrane is normally supported by six patagial ribs, but in two specimens, one ♀ and one ♂, seven patagial ribs were found; usually folded along the sides; when expanded convex above and concave below; margin frilled.

The erectile gular pouch below the throat and the wattles on the side of the head are believed to function as secondary sexual characters; it is possible that the sudden erection of the gular pouch and wattles is a protective device, as this reaction is generally observed when the animal is captured.

The animals are generally seen in pairs, one male and one female.

Coloration in life. Ashy grey dorsally with longitudinal series of black circles along median line. Head has two cross-bands touching orbits. Ventrally the body is greenish yellow. Throat and neck greenish with scattered black spots; black band across throat behind gular pouch. Gular pouch bright yellow. Dorsal side of patagium brown near body and purplish black with yellow patches near outer edge, this colouring being more pronounced anteriorly. Ventral side of patagium yellow with marginal series of black patches, this bright colour pattern being visible only when patagium is expanded.

The coloration is cryptic and harmonizes with the black and bright ash-grey patches on the trunks of coconut and arecanut palms, the

bright colours showing up only in movement. It was noticed that specimens collected from hilly regions are darker. In this connection it may be relevant to mention that an animal kept in a small cage for a day was seen to be dark; on removal to a larger, well-lighted cage, however, it would resume its normal coloration within a few minutes.

In preserved specimens the body is greyish brown with dark markings, sometimes with a series of black circles on the back. It would appear from this that Malcolm A. Smith's remark: 'Colour in life not described'[1] (1935, THE FAUNA OF BRITISH INDIA, REPTILIA AND AMPHIBIA Vol. II. Sauria: 143) is not confined to the colour of the patagia.

Distinguishing characters between sexes. The males are usually smaller than the females. The gular appendage in the male is about three times as long as it is in the female, and when extended forward reaches beyond the snout. In addition, the male has a nuchal fold and a low but distinct caudal crest.

Egg-laying to hatching. A gravid female measuring 190 mm. in total length was collected on 18 July 1960 at Mulakulam and kept in a fairly large cage with wire-gauze netting at the laboratory. For the first two days it refused food, later it began to feed on small grasshoppers and other insects. To provide a natural environment as far as possible a heap of moist soil with decaying leaves was placed on the floor of the cage. It was also provided with water. On the morning of 25 July 1960, it made a small pit in the moist soil about one-and-a-half inches deep and two inches in diameter. In the afternoon of the same day at 2.15 p.m. the animal was seen moving near the pit and still working at it. Crouching on the soil, with hind-limbs stretched apart, the clawed fore-limbs were used alternately to remove the earth from the pit. It appeared very active and excited; but, disturbed by a slight movement of the observer, it stopped digging, covered up the pit with soil, and left the place. After some time it went round the heap of soil and examined various places and finally, selecting a new spot, made another pit. It lay crouched over the pit with the snout touching the soil, the tail slightly lifted up and, with the vent bent downwards into the pit, laid four white eggs. The eggs were then covered with soft soil completely and the pit was so well covered that it was difficult

[1] In *J. Bombay nat. Hist. Soc.* (1940) **42**: 46 McCann in 'A Reptile and Amphibian Miscellany' refers to a live specimen which he obtained in N. Kanara. He describes the colour pattern but prefaces his remarks with the statement that it is 'by no means constant as it keeps changing within certain limits.'—EDS.

to locate it afterwards. It remained near the pit for some time and then climbed on to the wire-gauze netting of the cage. The whole process took about half an hour.

The egg is oval, slightly pointed at one end rounded at the other. It has a hard, resilient, partly calcified shell. The freshly laid egg is pure white in colour. The surface of the egg is sculptured with longitudinal striations extending from one end to the other. An egg was 14 mm. in length and 8.1 mm. in breadth and weighed 0.54 gm.

The eggs were kept buried in soil which was frequently kept moist to prevent dessication. During the incubation period the egg changes in size and shape, becoming more rounded as development proceeds. The dimensions of the egg during this period are below:

Period of incubation	Length	Breadth
Freshly laid egg (25-7-1960)	14 mm.	8.1 mm.
2 weeks	13.5 mm.	10.05 mm.
3 weeks	12.5 mm.	10.5 mm.
4 days before hatching (9-9-1960) ..	16.5 mm.	13.5 mm.

The egg hatched out on 13 September 1960, fifty days after it was laid. The newly hatched young was quite active from the time of hatching. It was dark in colour, but after a few minutes of exposure to light it assumed the characteristic colour pattern of the adult. The gular pouch is small and yellow in colour. The patagium is not large enough to enable the lizard to glide. But it can run about actively on the ground, contrasting with the clumsiness of the adult when on the ground.

The dimensions of the newly hatched lizard are given below:

Head and body	32 mm.
Tail	52 mm.
Patagium on one side	15 mm.
Patagium extended fully on both sides	35 mm.
Gular pouch	3.5 mm.

ACKNOWLEDGEMENTS

I am grateful to Dr. A. P. Mathew for guidance and to the Council of Scientific and Industrial Research for the award of a Research Assistantship during which the work was undertaken.

MAR IVANIOS COLLEGE,
TRIVANDRUM, K. O. JOHN
KERALA,
January 23, 1961.

13. FURTHER STUDIES ON PADDY-CUM-FISH CULTURE AT HESSERAGHATTA FISH FARM IN MYSORE STATE

(*With one text-figure*)

INTRODUCTION

In India several attempts have been made to popularise fish culture in paddy fields. In earlier pilot studies carried out, the author (1953) reported a production of 100 lb. (45.36 kg.) of fish per acre (0.405 hectare) of paddy field, and an increase of 7% to 13% in paddy yield. Dr. S. L. Hora, commenting on these experiments, observed that the poor results were due to defective selection of fish, and that the high rate of escapement and consequent low production were accounted for by murrel being an air-breathing fish able to travel across paddy fields. He recognised the value of the experiments, however, as there was an indication of an appreciable increase in the yield of paddy, and recommended the culture of any of the carps in such experiments.

The Fisheries Research Committee of the Government of India in its report (1954), while reviewing these experiments conducted in Mysore State, observed:

> 'although the murrel is not the ideal fish for experiments of this kind, we are of the opinion that, on account of the preference for this fish in the State, the experiments should be continued.'

The members of the Committee also discussed the design of the experiments and advised the lines on which further experiments should be carried out. The experiments were continued accordingly.

MATERIAL AND METHODS

1. Paddy plots

The experiments were conducted in specially designed paddy plots situated between the nursery pond and the fry nurseries in the